mate. It is of critical importance in the manufacture of electronics that the individual leads or balls are coplanar with one another. If the leads or balls are not coplanar and the IC package is soldered onto a substrate some of the leads or balls may be in electrical contact with the substrate while others will not be. The connections between a BGA and its substrate are not subject to visual inspection. Further, once a BGA is in place it is often easier to discard the entire substrate with BGA if the BGA is faulty. That is if a single IC package on a substrate that potentially contains numerous IC packages is not fully connected, then the entire substrate is defective and must either be repaired or discarded.

Replace the paragraph on page 4, lines 18 through 21 with the following paragraph:

FIGURE 5 - an alternate representation of Figure 4 including a plurality of A to D converters, cellular processors, and output shift registers where the output shift registers temporarily store the linear profile.

Replace the paragraph beginning on page 6, line 30 through page 7, line 11 with the following paragraph:

As schematically illustrated in FIGURES 4 and 5 sensor/processor 10 includes a CMOS camera 11. CMOS camera 11 is preferably a CMOS chip containing a 512 X 512 two dimensional CMOS array made up of pixels arranged in rows and columns. It is understood that the sensor could also be a charged coupled device (CCD) including pixels arranged in rows and columns. The CMOS sensor is made up of a grid of pixels including 512 rows and 512 columns. Light reflected form balls 22 is captured by CMOS sensor 11 and the individual pixels are charged to a representative voltage level. As illustrated in FIGURE 4 the voltage levels form each column are individually read out in parallel to 512 separate A/D convertors 30. Each column is individually processed by five hundred & twelve separate arithmetical logical units (ALU) 32. Those

A4 cont'd. of skill in the art would recognize that alternate logical components could be used such as look up tables (LUT) or programmed array logics (PAL). After processing, a linear profile is derived into registers at 34.

Replace the paragraphs on page 7, beginning at line 19 through page 8, line5 with the following paragraphs:

The CMOS sensor 11 portion of FIGURE 4 illustrates a single captured image including a profile of a ball 22 obstructed by noise. The plurality of ALU's determines the point within the captured image that represents the laser light line on the ball as compared to the surrounding noise. By reading out the columns of data in parallel as illustrated and described, the present invention measures data and therefore coplanarity at a much faster rate comparted to the prior art. ALUs 32 each select a single value or calculate a single value representative of a point on the laser line. While many options exist, the preferred techniques generally involve smoothing the data from each column and/or thresholding that data. The ALU then chooses the maximum value. This maximum value best represents the laser linear 16 reflected from the BGA.

A5

FIGURE 5 is an alternate illustration of a sensor/processor 10. FIGURE 5 includes a 512 X 512 array of photosensors wherein each column includes analog electronics 31. The data are converted to digital values by the analog to digital (A/D) converters 30, processed by a cellular processor 32 and stored in the registers 34.

Replace the paragraph on page 8, lines 21 and 22 with the following paragraph:

A6 Further, the wafer may be evaluated for planarity sampling points from the wafer and setting a second degree polynomial using a least squares method.

Replace the paragraph on page 20 line 6 through 26 with the following line:

A7 As shown in FIGURE 17 3D data is simultaneously pre-processed when the 2D data is pre-processed. Pre-processing of the 3D data occurs at 220. The pre-processing of the 3D data is preferably done in parallel with the 2D data processing

and measurements, and then held until needed for further processing. The pre-processing of 3D data involves smoothing and filling in the 3D data for further evaluation. This type of pre-processing is preferably performed using order-statistic filtering, such as a median filter. In addition, the data is filtered using non-linear filters that take advantage of the known geometry of the parts. In particular, the highest expected value in altitude is known from the engineering description of the part. In the same fashion, the lowest altitude expected on the part is known to reasonable accuracy. Thus, if any process results in an apparent measurement being taken that exceeds either extreme in altitude, it can be removed without changing the measurement to be taken, since it can be assumed to be spurious. In the case of data where the value is greater than 110% of the predicted value of the height, or top, of the ball, or lead, the data is removed. In addition, any data that is below the level of the substrate by more than 10% of the substrate's predicted height (z value), or has a height that is less than 90% of the expected height of the substrate, is removed. Spurious data arises from voids found in the substrate, and from apparent heights resulting from the laser beam reflecting off a more distant target as the scan passes over the top of a given target. Removal is important to prevent an abnormal weighting resulting from an abnormally large value, i.e. an unexpectedly large altitude, or depth.

A7 CONTD.

In the claims:

Please cancel claims 1-16 without prejudice.

New claims 17 through 41 have been added.

17. (New) A method for evaluating the quality of an IC package where the IC package includes a plurality of three dimensional features, the method comprising:

A8

acquiring a two dimensional image characteristic of a portion of the IC package, the two dimensional image defined by a plurality of pixels having at least an address and a pixel intensity;